



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/476,684	12/30/1999	GOPAL AVINASH	GEMS:0074-15	8155

7590 12/03/2003
PATRICK S YODER
7915 FM 1960 WEST
SUITE 330
HOUSTON, TX 77070

EXAMINER

DASTOURI, MEHRDAD

ART UNIT	PAPER NUMBER
----------	--------------

2623

DATE MAILED: 12/03/2003

7

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/476,684

Applicant(s)

AVINASH, GOPAL

Examiner

Mehrdad Dastouri

Art Unit

2623

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 August 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-39 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

1. Applicant's response filed August 11, 2003, has been entered and made of record.
2. Applicant's arguments concerning the double-patenting rejection of Claims 1-39 have been fully considered and they are persuasive. In view of Applicant's remarks, the double-patenting rejection of Claims 1-39 has been withdrawn.
3. Applicant's arguments regarding 35 U.S.C. § 103 rejections based on the teachings of Li et al in view of Polzin et al, have been fully considered but they are not persuasive. The examiner is absolutely aware of 35 U.S.C. § 103(c) requirements. Accordingly, in the previously submitted non-final Office Action (Paper # 5), the Examiner had expressly indicated that the teachings of IEEE Paper ISBN: 0278-0062 dated June 1991, Noll et al., titled "Homodyne Detection in Magnetic Resonance Imaging", has been relied upon for blending texture from the image data into the processed data. This publication is cited in Polzin et al., U.S. Patent 6,166,545, and its methodology (Sections II and III, in particular "Partial k-Space") has been described in the background and summary of Polzin et al. Patent as the basis for the claimed blending process. This publication has been referred to in the notice of reference cited (PTO Form 892) which is included in previous correspondence (Paper # 5), and a copy of the paper had been previously submitted. The teachings of Noll et al is not the Polzin et al. invention, and consequently is available for use under 35 U.S.C. § 103 rejection. No further teachings of Polzin et al have been referred to in the Office Action.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 2, 4-8, 22-24, 26-29, 30-33 and 35-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (U.S. 5,602,934) in view of Polzin et al(U.S. 6,166,545).

Regarding Claim 1, Li et al disclose a method for enhancing a discrete pixel image, the method comprising the steps of:

(a) smoothing image data representative of pixels of a reconstructed image (Figures 1 and 2; Equations 1-12; Column 5, Lines 64-67, Column 5, Lines 1-47; Column 7, Lines 4-13);

(b) identifying structural features from the smoothed image data (Figures 1 and 2; Column 7, Lines 4-67, Column 8, Lines 1-57);

(c) orientation smoothing the structural features (Figures 1 and 2; Column 5, Lines 64-67, Column 5, Lines 1-47);

(d) homogenization smoothing non-structural regions (Figures 1 and 2; Column 6, Lines 12-47; Column 7, Lines 4-67, Column 8, Lines 1-57);

(e) orientation sharpening the structural features (Figure 4; Equations 13-21; Column 10, Lines 2-67, Column 11, Lines 1-50);

(f) blending the image data into data processed in accordance with the foregoing steps (Figure 5, Steps 510, 516 and 518; Figure 6; Column 11, Lines 66-67; Column 12, Lines 1-10).

Li et al do not explicitly disclose blending texture from the image data into the processed data.

Blending texture from the image data into the processed data is well known as taught by Polzin et al based on homodyne detection in MRI (Teachings of IEEE Paper ISBN: 0278-0062 dated June 1991, Sections II and III, in particular "Partial k-Space).

Polzin et al disclose MRI reconstruction using partial echo and partial NEX data acquisition by blending texture from the image data into the processed data of the image (Column 1, Lines 16-34; Background of the Invention).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Li et al invention according to the teachings of Polzin et al to blend texture from the image data into the data processed in accordance with the steps (a) through (e) because it will enhance MRI images and will reconstruct the image by including missing image information.

Regarding Claim 2, Li et al further disclose the method of Claim 1, wherein the structural features are determined based upon a scaled threshold value (Column 13, Lines 9-40; Column 15, Lines 34-40).

Regarding Claim 4, Li et al further disclose the method of Claim 1, wherein in step (b) the structural features include pixels having values below a first threshold value but above a second, lower threshold value, and positioned adjacent to a structural pixel (Column 15, Lines 34-40).

Regarding Claim 5, Li et al further disclose the method of Claim 1, wherein step (c) includes dominant orientation smoothing pixels based upon a dominant orientation and an orientation orthogonal to the dominant orientation (Figures 2 and 3; Column 6, Lines 12-47).

Regarding Claim 6, Li et al further disclose the method of Claim 5, wherein dominant orientation smoothing is performed based upon a predetermined relationship between a characteristic of each structural pixel in the dominant orientation and in the orthogonal orientation (Figures 2 and 3; Column 6, Lines 12-47).

Regarding Claim 7, Li et al further disclose the method of Claim 6, wherein the characteristic is a number of counts of orientations within a neighborhood of each structural pixel (Column 7, Lines 4-36).

Regarding Claim 8, Li et al further disclose the method of Claim 1, wherein step (e) is performed only for structural pixels having a value above a desired lower limit value (Column 14, Lines 10-43).

With regards to Claims 22 and 23, arguments analogous to those presented for Claims 1 and 5 are applicable to Claims 22 and 23.

With regards to Claim 24, arguments analogous to those presented for Claim 2 are applicable to Claim 24.

With regards to Claim 26, arguments analogous to those presented for Claim 4 are applicable to Claim 26.

With regards to Claim 27, arguments analogous to those presented for Claim 6 are applicable to Claim 27.

With regards to Claim 28, arguments analogous to those presented for Claim 7 are applicable to Claim 28.

Regarding Claim 29, Li et al further disclose the method of Claim 1, wherein step (d) is performed only for structural pixels having a value above a desired lower limit value (Column 13, Lines 33-54).

With regards to Claims 30-32, arguments analogous to those presented for Claim 1 are applicable to Claims 30-32. Li et al further disclose the image acquisition system includes a magnetic resonance scanner (Figure 1; Column 5, Lines 10-47).

With regards to Claim 33, arguments analogous to those presented for Claim 2 are applicable to Claim 33.

With regards to Claim 35, arguments analogous to those presented for Claim 4 are applicable to Claim 35.

With regards to Claim 36, arguments analogous to those presented for Claim 5 are applicable to Claim 36.

With regards to Claim 37, arguments analogous to those presented for Claim 6 are applicable to Claim 37.

With regards to Claim 38, arguments analogous to those presented for Claim 7 are applicable to Claim 38.

With regards to Claim 39, arguments analogous to those presented for Claim 8 are applicable to Claim 39.

6. Claims 3, 9-21, 25 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (U.S. 5,602,934) further in view of Polzin et al (U.S. 6,166,545) and Dumoulin et al (U.S. 6,571,020).

Regarding Claim 3, Li et al disclose the method of Claim 2, wherein the scaled threshold value is computed based upon an initial threshold value (Column 13, Lines 9-40; Column 14, Lines 10-43; Column 15, Lines 34-40. Threshold function with lower cut off side value $0.9r$ and higher cut off value $1r$).

Li et al do not explicitly disclose the scaling factor is input by a user.

Dumoulin et al disclose a method for storing additional information in primary data sets for enhancing regions of MRI images by applying a user-adjustable intensity threshold (Abstract, Lines 13-18).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify Li et al and Polzin et al combination according to the teachings of Dumoulin et al to apply a scaled threshold value input by a user because it will result in enhancing extraction of the structural features.

With regards to Claims 9 and 10, arguments analogous to those presented for Claims 1-3 are applicable to Claims 9 and 10.

With regards to Claim 11, arguments analogous to those presented for Claim 4 are applicable to Claim 11.

With regards to Claim 12, arguments analogous to those presented for Claim 5 are applicable to Claim 12.

With regards to Claim 13, arguments analogous to those presented for Claim 6 are applicable to Claim 13.

With regards to Claim 14, arguments analogous to those presented for Claim 7 are applicable to Claim 14.

With regards to Claim 15, arguments analogous to those presented for Claim 8 are applicable to Claim 15.

With regards to Claims 16 and 17, arguments analogous to those presented for Claims 1-4 are applicable to Claims 16 and 17.

With regards to Claim 18, arguments analogous to those presented for Claim 5 are applicable to Claim 18.

With regards to Claim 19, arguments analogous to those presented for Claim 6 are applicable to Claim 19.

With regards to Claim 20, arguments analogous to those presented for Claim 7 are applicable to Claim 20.

With regards to Claim 21, arguments analogous to those presented for Claim 8 are applicable to Claim 21.

With regards to Claims 25 and 34, arguments analogous to those presented for Claim 3 are applicable to Claim 25 and 34.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mehrdad Dastouri whose telephone number is (703) 305-2438. The examiner can normally be reached on Monday to Friday from 8:00 a.m. to 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9143 for regular communications and (703) 872-9143 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the technology Center Customer Service Office whose telephone number is (703) 306-0377.

MEHRDAD DASTOURI
PRIMARY EXAMINER

Mehrdad Dastouri

Mehrdad Dastouri
Primary Examiner
Group Art Unit 2623
December 1, 2003